
# Watlington Neighbourhood Development Plan Strategic Flood Risk Assessment

Final Report

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Watlington Parish Council

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# Revision History

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| | | |

# Contract

This report describes work commissioned by Gill Bindoff, on behalf of Watlington Parish Council, by an email dated 18/08/2017. Paul Eccleston and Fiona Hartland of JBA Consulting carried out this work.

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# Purpose

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# Acknowledgements

Many thanks to Watlington Parish Council and Watlington Neighbourhood Plan Group for their help, in particular Gill Bindoff, Tom Bindoff and Tony Powell.




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# Abbreviations

| | |
|---|---|
| AEP | Annual Exceedance Probability |
| AONB | Area of Outstanding Natural Beauty |
| FRA | Flood Risk Assessment |
| NDP | Neighbourhood Development Plan |
| NPPF | National Planning Policy Framework |
| SFRA | Strategic Flood Risk Assessment |
| SODC | South Oxfordshire District Council |
| SuDS | Sustainable Drainage Systems |
| WNDP | Watlington Neighbourhood Plan |

# 1 Introduction

## 1.1 Purpose of the document

This document assesses the flood risk to all 16 sites considered within the Watlington Neighbourhood Development Plan (WNDP) 2017 - 2033. This report seeks to support the sequential, risk-based selection of sites within the draft WNDP, through application of the Sequential and Exception Tests, and providing a more detailed assessment of potential development sites in Watlington Parish which have been identified as having a risk of flooding.

Flood risk and watercourse management are central themes in the WNDP, and have been a key consideration in the site selection process. The 16 potential development sites identified within the WDNP were assessed using an indicative 'Red-Amber-Green' approach against the WNDP objectives, which included to 'reduce flood risk by managing flows'. Therefore, a risk-based approach has been applied in the identification of preferred WNDP sites. However, this document will formalise the process, and provide a more detailed consideration of flood risk.

## 1.2 Watlington Neighbourhood Development Plan (WNDP)

The WNDP is a community-led plan, developed to identify areas of potential growth in the town of Watlington from 2017 to 2033. A minimum of 238 homes are to be supplied in Watlington before 2033, which must be balanced against the historic character of the town, the surrounding Chilterns Area of Outstanding Natural Beauty (AONB), possible re-alignment of the B4009 and conservation of chalk-fed streams, ponds and springs.

The plan has undergone pre-submission consultation with key stakeholders, and will subsequently be submitted to SODC for consultation, followed by a Local Referendum to seek public approval.

## 1.3 Planning Policy

Under the National Planning Policy Framework (NPPF) (2014), Neighbourhood Development Plans (NDPs) are subject to the same flood risk policies as Local Planning Authority Local Plans. As a result, a sequential, risk-based approach should be applied to allocate sites within the WNDP.

Further details on national and local planning policy on flood risk applicable to the WNDP is available within the South Oxfordshire Level 1 Strategic Flood Risk Assessment (2017).

# 2 Understanding flood risk in Watlington Parish

### 2.1.1 Watlington Parish

The Neighbourhood Area of Watlington is designated as the boundary of the Watlington Parish, which includes the settlements of Watlington, Christmas Common, Greenfield and Howe Hill. As all of the WNDP potential development sites are located within the town of Watlington, this section provides a brief overview of the flood risk to Watlington town, rather than the wider Neighbourhood Area.

Detailed mapping of the flood risk to the Watlington Neighbourhood Plan Area, and the entire South Oxfordshire District, is available in Appendices D to J of the South Oxfordshire Level 1 SFRA (2017).

### 2.1.2 Fluvial Flood Risk

The Chalgrove Brook, classified as a main river by the Environment Agency, flows through the centre of the town. As a result, much of Watlington town centre is located within Flood Zone 2 (1 in 1,000-year flood event) and Flood Zone 3 (1 in 100-year flood event). A further flood risk is posed by sections of watercourse which have been culverted and straightened, as blockage or overtopping can cause localised flooding.

Fluvial flood modelling undertaken as part of the South Oxfordshire Level 1 SFRA (2017) suggests that the current Flood Zones in Watlington are likely to increase in extent, as a result of the higher flows predicted to occur with climate change.

### 2.1.3 Groundwater Flood Risk

The Chalgrove Brook is fed by groundwater stored within the underlying chalk geology, which may rise to the ground surface as spring flows after prolonged rainfall. This was most notably seen in February 2014, where following months of prolonged rainfall, groundwater levels in the underlying chalk bedrock rose. In addition, spring flows and saturated overland flows were generated on open land behind Spring Lane, Watcombe Manor, Springfield Farm, Hill Road and along Watlington Footpath 12.

Severe flooding affected the roads of Station Road, Brook Street, Spring Lane, Gorwell and The Goggs for several weeks, with groundwater forming a continuous stream of water from lower Hill Road to the junction between the High Street and Shirburn Road. Properties were evacuated and internally flooded in The Goggs and Shirburn Street, while property gardens on Hill Road were flooded for many weeks by spring flows from fields to the south. Saturated overland flows were also reported to pond on the fields north of Hill Road, providing a source of further flows, which flooded the adjacent pub car park.

### 2.1.4 Surface Water Flood Risk

Surface water flooding occurs where rainfall is unable to enter the ground or a drainage system, and forms standing water on the ground surface. Surface water flood risk is concentrated along watercourses and within the urban centre of Watlington, where there are large areas of hardstanding. In particular, Brook Street, Cuxham Road, Britwell Road, form passages for surface water through the centre of the town during the 1 in 30-year rainfall event and higher return periods.

### 2.1.5 Other sources of flood risk

Watlington is not at risk of flooding from reservoirs or canals. The SODC SFRA report 10 properties at risk in the OX49 5 postcode sector, from Thames Water records. However, this sector includes the settlements of Watlington, Lewknor, Britwell Salome, Brightwell Baldwin, Christmas Common and Aston Rowant, therefore it is unclear how many of these properties are in Watlington itself.

Thames Water has produced the Watlington Drainage Strategy[1], which provides a framework for managing sewer flooding and addressing future challenges to the sewer network within Watlington, Cuxham and Britwell Salome. The preferred plan to alleviate sewer flooding in Watlington will involve:

1 Thames Water (2016) Watlington Drainage Strategy - Stage 1. Available at: https://corporate.thameswater.co.uk/About-us/Investing-in-our-network/Drainage-strategies/-/media/9AC8CABE81C84CC9A15D5F9B1A4C861E.ashx?bc=White&db=web&la=en&thn=1&ts=e09480f0-5bc3-493c-9392-6428a393d251.pdf

- undertaking localised sewer rehabilitation, to reduce ingress of groundwater into the foul sewer system;
- replacement of manhole covers, to prevent ingress of surface water into the foul sewer system; and
- continued monitoring and analysis of sewer levels.

# 3 Applying the Sequential Test and Exception Test in preparation of a Neighbourhood Development Plan

## Introduction

The Sequential Test and Exception Test are processes put in place by the NPPF to ensure that development is allocated and permitted in areas of the lowest possible flood risk. The general aim is to steer development away from the medium and high risk areas (Flood Zone 2 and Flood Zone 3), however the risk from other sources of flooding must also be considered.

The following sections provide an overview of applying the Sequential and Exception Test within the WNDP. For full details and guidance on application of the Sequential Test and Exception Test, please see national Planning Practice Guidance and Section 4 of the South Oxfordshire Level 1 SFRA (2017).

## 3.1 The Sequential Test

The Sequential Test is a process which must be performed when determining the location of future development. Potential development sites are considered against their location within Flood Zone 1 (low risk), Flood Zone 2 (medium risk) and Flood Zone 3a (high risk), as well as their coverage by other sources of flood risk.

It is normally reasonable to presume that individual sites within Zone 1 satisfy the requirements of the Sequential Test; however, consideration should be given to risk from all sources of flooding, as well as areas with critical drainage problems.

Where required growth cannot be met by sites within Flood Zone 1, sites within Flood Zone 2 are then considered within a more detailed, Level 2 SFRA. If development cannot be accommodated within Flood Zone 2, lower risk sites in Flood Zone 3 can be considered, although the Exception Test must be applied.

The process of the Sequential Test is outlined below, in Figure 3-1.

## 3.2 The Exception Test

Following application of the Sequential Test, it may not be possible for all development to be located in areas with a low probability of flooding. In this case, the Exception Test must then be applied, to ensure that more vulnerable property types, such as residential development can be implemented safely.

For the Exception Test to be satisfied, and development to be allocated, the following two criteria must be met:

1. The development must provide wider sustainability benefits to the community that outweigh flood risk.
2. A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The process of applying the Exception Test is outlined below, in Figure 3-2.

Figure 3-1: Application of the Sequential Test

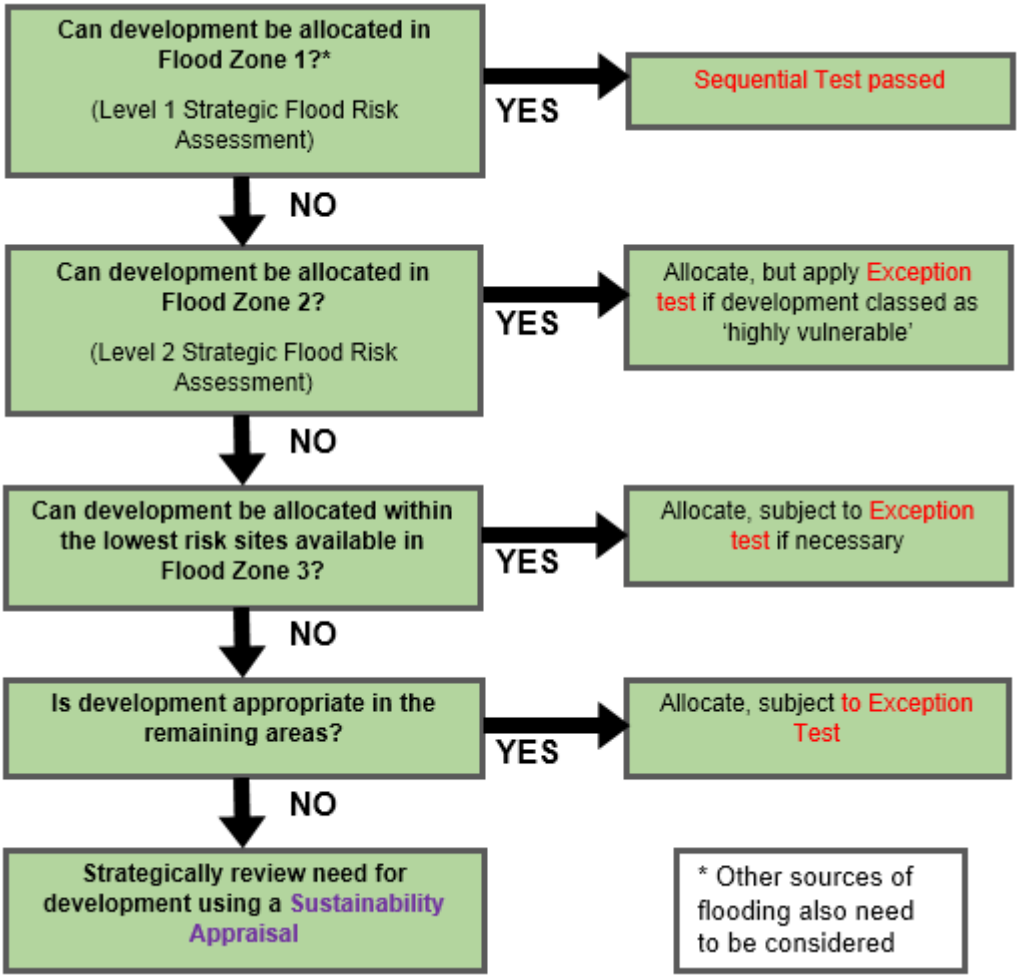
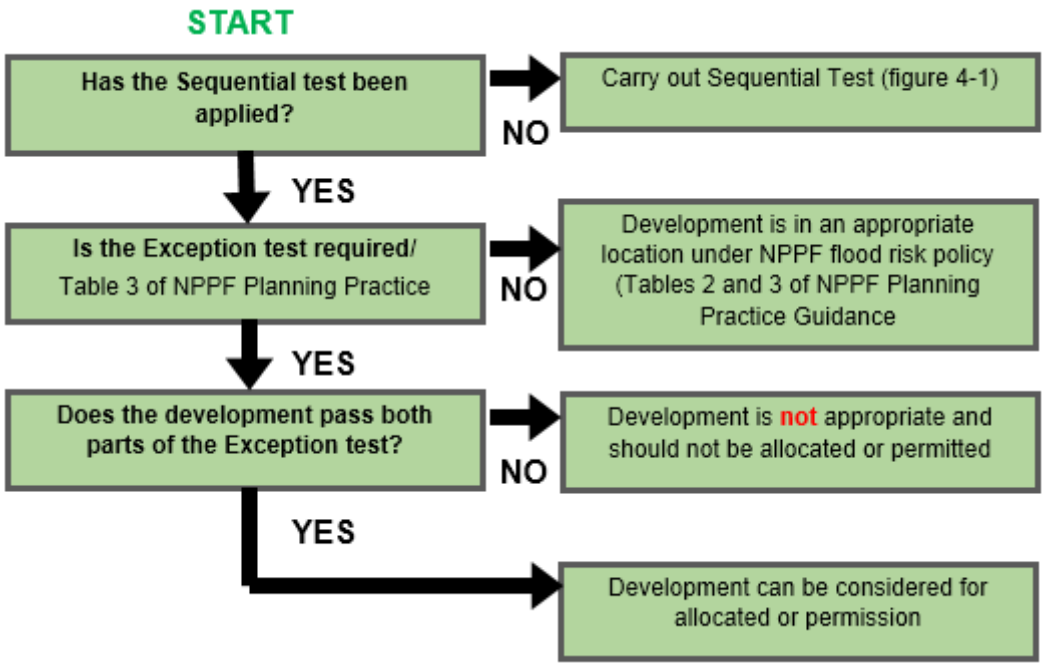



Figure 3-2: Application of the Exception Test



# 4 Assessment of flood risk for the Watlington NDP SFRA

## 4.1 Site selection process

Prior to consultation on the draft WNDP, a lengthy process was undertaken by the Neighbourhood Plan Group to identify potential development sites for allocation. A total of 42 potential sites were identified following the SODC Strategic Housing Land Availability Assessment (SHLAA) (2013) and a further call for sites in 2016. The availability of these sites was subsequently reviewed with landowners, which led to 19 sites becoming unavailable for development.

Of the 23 remaining available sites, two were located in the neighbouring parish of Pyrton, therefore unavailable for allocation in the Watlington NDP, and one was withdrawn. Four small sites were below the size threshold for allocation within the WNDP, and instead considered as future windfall sites.

The 16 remaining sites were assessed within the WNDP Sustainability Appraisal against a series of planning and environmental criteria, including flood risk and the conservation of chalk watercourses. These 16 sites are the focus of this SFRA and Sequential Test Report, and mapped in Appendix B.

The WNDP Sustainability Appraisal assessment, public consultation with the community and wider development plans within the district informed the selection of three preferred sites and two additional sites.

Full details of the site selection process are available in the WNDP 'Development Strategy Topic Paper'.

## 4.2 Assessment of flood risk in potential development areas

### 4.2.1 Site screening assessment

Digitised boundaries of the 16 potential development sites were supplied by Watlington Parish Council. Each site area was assessed by calculating the proportion of the site at risk from fluvial, surface water and groundwater flooding. Table 4-1 summarises the datasets used to determine the flood risks to each site.

Table 4-1: Sources of data used to assess flood risk within the Watlington SFRA.

| Source of flood risk | Dataset used in analysis | Source of data |
|---|---|---|
| **Fluvial (rivers)** | Flood Zone 1 | Data.gov.uk |
| | Flood Zone 2 | Data.gov.uk |
| | Flood Zone 3a | Data.gov.uk |
| **Surface water (rainfall)** | Risk of Flooding from Surface Water Map 1 in 30-year return period | Data.gov.uk |
| | Risk of Flooding from Surface Water Map 1 in 100-year return period | Data.gov.uk |
| | Risk of Flooding from Surface Water Map 1 in 1,000-year return period | Data.gov.uk |
| **Reservoirs** | Risk of Flooding from Reservoirs Map | Data.gov.uk |
| **Groundwater** | JBA Consulting Groundwater Flood Map | JBA Consulting |
| **Historic Flooding** | Historic Flood Map | Environment Agency |

The proportion of flood risk coverage for each of the 16 sites is provided in the Site Screening Table in Appendix A. The percentage of the site at flood risk from a particular Flood Zone or event excludes the percentage of the site at flood risk from a higher risk Flood Zone or event. For example, the coverage of Flood Zone 1, 2 and 3a within a site will total 100%.

### 4.2.2 Assessment of sites in Flood Zone 1

Firstly, all sites located entirely within Flood Zone 1 were selected, to determine whether there was potential to allocate all required development for Watlington within these sites. Eight of the 16 sites were identified as being 100% within Flood Zone 1:

- WAT 3 - Land at Chiltern Farm
- WAT 9 - Pryton Lane, opposite Icknield
- WAT 10 - Land west of Willow Close
- WAT 19 - Hill Road, west of surgery
- WAT 29 - Land east of surgery
- WAT 40 - South of Watcombe Manor, Farm Lane
- WAT 41 - East of Howe Road, adjoining the Icknield Way
- WAT 42 - West of Howe Road, adjoining the Icknield Way

Of these sites, three sites were excluded within the WNDP on the following planning grounds:

- WAT 41 and WAT 42 - both sites lie within the Chilterns AONB, and a considerable distance outside the built form of Watlington. Therefore, development would impact on the landscape setting.
- WAT 40 - part of the site has previously been affected by groundwater flooding. In addition, there are several planning constraints to the site, including its location outside the Watlington built form, yet within the Chilterns AONB and a Conservation Area, access considerations and loss of high grade agricultural land.

  The extents of Flood Zone 2 and 3 lie very close to the northwest border of the site, and the site was originally identified within the WNDP Development Strategy as at risk of fluvial flooding. However, subsequent assessment of the current Flood Zone extents has identified the site to lie in Flood Zone 1.

Where sites were at known groundwater flood risk, they were not progressed further, due to the susceptibility of Watlington to groundwater flooding, and the difficulty of achieving effective mitigation measures. In particular, WAT 3 and WAT 30 were found to be unsuitable due to previous emergence of groundwater and saturated overland flows from the site, which contributed to flooding of Spring Lane and adjacent property curtilages on Hill Road in 2014.

The remaining available sites in Flood Zone 1 did not provide the minimum number of 238 homes required within Watlington, and instead sites in Flood Zone 2 were considered for allocation.

### 4.2.3 Assessment of sites in Flood Zone 2

The selection process was extended to sites within Flood Zone 2. However, the required development numbers could not be adequately accommodated in Flood Zone 2, as all of the sites were also situated within Flood Zone 3a.

### 4.2.4 Preferred sites

Following extensive public consultation and assessment within the WNDP Sustainability Appraisal, three sites at the west of Watlington, WAT 11 / WAT 12 (Site A), WAT 10 (Site B) and WAT 9 (Site C) were identified within the WNDP as preferred sites. Together, the three sites provide sufficient land for the required housing numbers in Watlington, and form an area of strategic land for road realignment of the B4009. Public consultation outcomes favoured development of these three sites within the WNDP.

Furthermore, WAT 34 (Site D), WAT 19 and WAT 29 (Site E) were identified as appropriate additional sites where development proposals would be encouraged.

Of these preferred and additional sites, WAT 11 / 12 (Site A) and WAT 34 (Site D) were partially located within Flood Zone 2 and Flood Zone 3a, and therefore required a more detailed site-level assessment as part of a Level 2 SFRA.

## 4.3 Level 2 SFRA site assessment

A detailed Level 2 SFRA was undertaken for site WAT 11 / 12 (Site A), south of Cuxham Road, and site WAT 34 (Site D) adjoining Bucklands Paddock.

Although a very small proportion of WAT 34 (Site D) is classified as within Flood Zone 3a, the site has been proposed for park home development. These permanent, pre-fabricated homes are classified as 'highly vulnerable' development in terms of flood risk under the NPPF, which also warranted a more detailed assessment.

The Level 2 Summary Site Sheets in Appendix C detail the flood risk and surface water drainage considerations to be taken into account at sites WAT 11 / 12 and WAT 34, should they be allocated within WNDP. As fluvial and surface water flood risk covers a relatively small area of the sites, it should allow flood risk to be managed and mitigated onsite.

### 4.3.1 Site-specific recommendations

The Level 2 SFRA assessment identified the below flood risk and drainage recommendations, which should be considered within the subsequent site-specific FRA and surface water drainage strategy required for both sites.

#### WAT 11 / 12 (Site A)

1. The site layout should be planned sequentially, avoiding development within Flood Zone 2 and Flood Zone 3.

2. SuDS used for the storage of surface water should be located outside Flood Zone 3, to prevent a loss in floodplain storage and minimise the risk of fluvial flooding to the structures.

1.3. Infiltration testing and groundwater monitoring are likely to be required before the use of infiltration drainage systems, such as soakaways.

#### WAT 34 (Site D)

1. The site layout should be planned sequentially, avoiding development within Flood Zone 2 and Flood Zone 3.

2. Infiltration testing, and where necessary groundwater monitoring, are recommended before the use of infiltration drainage systems on the site, such as soakaways.

3. Due the higher vulnerability of the proposed development, safe access and egress arrangements for the site in the event of a flood should be specified within the site-specific flood risk assessment, and a Flood Evacuation Plan may be required.

# 5 Summary and conclusions

The Watlington SFRA and Sequential Test has been produced to provide part of the evidence base to support the selection of development sites within the Watlington Neighbourhood Development Plan. An indicative sequential and risk-based assessment of the potential 16 sites was undertaken within the Suitability Appraisal of the WNDP, however this report seeks to provide a more robust framework for the assessment of flood risk.

A summary of the assessment process and main findings are as follows:

- Screening was undertaken on 16 potential development sites for fluvial, surface water and groundwater flood risk, with results summarised in Appendix A.
- Potential development sites were assessed sequentially, starting with sites entirely within Flood Zone 1.
- Much of the housing requirement within the Watlington Neighbourhood Area could be provided within Flood Zone 1, through the allocation of preferred sites WAT 9 (Site C) and WAT 10 (Site B), as well as additional sites WAT 19 / 29 (Site E). However, after planning constraints were accounted for, the growth of 238 homes could not be fully accommodated within Flood Zone 1.
- Sites within Flood Zone 2 were next considered; yet all were also located within Flood Zone 3a. A site-specific Level 2 SFRA was undertaken for WAT 11 / 12 (Site A) and WAT 34 (Site D), the two preferred options for the WNDP situated within Flood Zone 2 and 3a.
- Due to the relatively small proportion of the sites covered by Flood Zones 2 and 3a, it is likely to be possible for the existing flood risk to be managed and mitigated by sensitive development of the site. A series of flood risk considerations for sites WAT 11 / 12 (Site A) and WAT 34 (Site D) have been outlined in the Level 2 site summary sheets within Appendix C.

In conclusion, it is considered that the three preferred and two additional sites identified within the WNDP have been selected using a sequential, risk-based approach, with consideration of flood risk from fluvial, surface water and groundwater sources. For the two sites (A and D) which required a Level 2 SFRA, it has been identified that these sites could be safely developed, principally by avoiding building dwellings in those parts of the sites within Flood Zone 2 and 3. A site-specific FRA will be required for both sites, which must demonstrate in detail how the site will be safely developed.

# Appendices

# A Watlington Site Assessment Table

| Site Reference | Site Location | SODC Site Reference | | Site area (Ha) | Existing use | Proposed use | Flood vulnerability | Fluvial Flood Risk | | | Surface Water Flood Risk | | | Groundwater Flood Risk | Decision | Reasons for decision | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SHLAA (2013) | HELAA (2017) | | | | | FZ1 | FZ2 | FZ3a | 1 in 30-year | 1 in 100-year | 1 in 1,000-year | | | Flood risk grounds | Other planning grounds |
| **WAT 1** | **Rear of Britwell Rd** | 35 | 816 | 1.28 | Agriculture - used as grazing | Residential | More vulnerable | 81% | 6% | 13% | 0% | 0% | 0% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Rejected** | • Part of the site (13%) is at high risk of fluvial flooding (Flood Zone 3a). | • Development impact on AONB landscape views.<br>• Site adjoins Conservation Area. |
| **WAT 10 (SITE B)** | **Land west of Willow Close** | 255 | | 6.39 | Agriculture | Residential | More vulnerable | 100% | 0% | 0% | 0% | 0% | 0% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Preferred Site** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Can provide 38 - 60 dwellings, and 40% of affordable homes required. |
| **WAT 11 (SITE A - part)** | **Land South of Cuxham Road** | 89 | 847 | 1.05 | Agriculture - occasional pasture/grazing | Residential | More vulnerable | 59% | 12% | 29% | 0% | 1% | 26% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Preferred Site** | • Part of the site (29%) is at high risk of fluvial flooding (Flood Zone 3a).<br>• Part of the site is at risk of surface water flooding. | • Site is outside AONB, yet adjoining the Watlington built form.<br>• Site can provide up to 140 dwellings and area for realignment of the B4009. |
| **WAT 12** | **Land South of Cuxham Road (adjacent to Windmill Close)** | 181 | 906 | 8.91 | Agriculture – livestock, grazing and arable | Residential | More vulnerable | 88% | 1% | 11% | 1% | 3% | 8% | • Majority of site: Groundwater levels are estimated to be 0.5 - 5m below the ground surface.<br>• Southeast corner of site: Groundwater levels are estimated to be at least 5m below the ground surface. | **Preferred Site** | • Part of the site (11%) is at high risk of fluvial flooding (Flood Zone 3a). | • The majority of the site is suitable for development and can make a significant contribution to the housing need identified in the WNDP.<br>• Development may affect protected chalk stream. |
| **WAT 19 (SITE E - part)** | **Hill Road, west of surgery** | | | 0.26 | Fallow grassland with footpath | Residential | More vulnerable | 100% | 0% | 0% | 0% | 0% | 0% | Groundwater levels are estimated to be at least 5m below the ground surface. | **Chosen Additional Site** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Site is within Watlington Built Form.<br>• Site is within the AONB.<br>• Development would remove open green corridor south of Hill Road. |
| **WAT 29 (SITE E - part)** | **Land east of surgery** | | | 0.29 | Grassland and trees | Residential | More vulnerable | 100% | 0% | 0% | 0% | 0% | 0% | Groundwater levels are estimated to be at least 5m below the ground surface. | **Chosen Additional Site** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Site is within the AONB and may impact on landscape views.<br>• Development would remove existing open green corridor.<br>• The site is likely to become available and deliverable during the period of the WNDP. |
| **WAT 2a** | **Rear of Watcombe Manor** | 182 | | 1.58 | Agriculture - used as grazing | Residential | More vulnerable | 75% | 2% | 23% | 0% | 0% | 3% | • Majority of site: Groundwater levels are estimated to be 0.5 - 5m below the ground surface.<br>• Western corner of site: Groundwater levels are estimated to be at least 5m below the ground surface. | **Rejected** | • Part of the site (23%) is at high risk of fluvial flooding (Flood Zone 3a). | • Site is located within AONB.<br>• Site is located outside Watlington Built Form.<br>• Site considered unsuitable within SODC Landscape Capacity Assessment for Additional Sites on the Edge of Larger Villages in South Oxfordshire. |
| **WAT 2b** | **Rear of Watcombe Manor** | 182 | 907 | 4.03 | Agriculture - used as grazing, with farm track | Residential | More vulnerable | 36% | 5% | 59% | 1% | 1% | 7% | • Majority of site: Groundwater levels are estimated to be 0.5 - 5m below the ground surface.<br>• South of site: Groundwater levels are estimated to be at least 5m below the ground surface. | **Rejected** | • Part of the site (59%) is at high risk of fluvial flooding (Flood Zone 3a).<br>• Recorded groundwater flooding in Winter 2014. | • Site is adjacent to AONB and Conservation Area - possible impact on AONB landscape views.<br>• Site considered unsuitable within SODC Landscape Capacity Assessment for Additional Sites on the Edge of Larger Villages in South Oxfordshire.<br>• Deliverability unknown at this stage. |
| **WAT 3** | **Land at Chiltern Farm** | 188 | 909 | 3.46 | Improved pasture – grassland/grazing | Residential | More vulnerable | 100% | 0% | 0% | 0% | 0% | 6% | Groundwater levels are estimated to be at least 5m below the ground surface.<br>However, groundwater emergence and saturated overland flows from site contributed to flooding of Spring Lane and adjacent properties on Hill Road in 2014. | **Rejected** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding.<br>• Documented groundwater emergence on site, which flooded road and adjacent property in 2014. | • Site is located outside Watlington Built Form.<br>• Likely impact on AONB or landscape views - SODC Landscape Capacity Assessment for Additional Sites on the Edge of Larger Villages in South Oxfordshire recommended no development of the site.<br>• Access considerations required, as landlocked. |
| **WAT 30** | **Land east of Chiltern Gardens** | 188 | 1001 | 3.02 | Rough pasture, fallow for some years. | Residential | More vulnerable | 93% | 0% | 7% | 6% | 1% | 14% | Groundwater levels are estimated to be at least 5m below the ground surface.<br>However, groundwater emergence and saturated overland flows from site contributed to flooding of Spring Lane and properties on Hill Road in 2014. | **Rejected** | • Part of the site (7%) is at high risk of fluvial flooding (Flood Zone 3a).<br>• Part of the site is at risk of surface water flooding.<br>• Documented groundwater emergence on site, which flooded road and nearby property in 2014. | • SODC Landscape Capacity Assessment recommended no development.<br>• Access considerations required, as landlocked. |
| **WAT 34 (SITE D)** | **Bucklands Paddock** | | | 0.31 | Unused grass and scrub area | Residential – park homes | Highly vulnerable | 94% | 3% | 3% | 0% | 1% | 9% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Chosen Additional Site** | • A small part of the site (3%) is at high risk of fluvial flooding (Flood Zone 3a).<br>• Part of the site is at risk of surface water flooding.<br>• Flood risk impacts on neighbouring properties needs to be considered. | • Access considerations required, as landlocked.<br>• Possible impact on landscape views. |
| **WAT 38** | **Watcombe Manor** | 388 | | 0.44 | Existing barn and hardstanding | Residential | More vulnerable | 97% | 0% | 3% | 0% | 5% | 11% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Not allocated (planning already granted)** | • A small part of the site (3%) is at high risk of fluvial flooding (Flood Zone 3a)<br>• Part of the site is at risk of surface water flooding.<br>• Recorded groundwater flooding in Winter 2014. | • Site is located within Conservation Area.<br>• Site not allocated, as planning permission for 5 dwellings already granted (planning applications P11/E0281 and P11/E0282CA). |
| **WAT 40** | **South of Watcombe Manor Farm Lane** | | | 1.84 | Agriculture -arable | Residential | More vulnerable | 100% | 0% | 0% | 0% | 1% | 1% | • Majority of site: Groundwater levels are estimated to be at least 5m below the ground surface.<br>• Northwest corner of site: Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Rejected** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding.<br>• Recorded groundwater flooding in Winter 2014. | •Site is outside Watlington Built Form.<br>• Site is within AONB, with possible impact on landscape views.<br>• Site is partially within a Conservation Area. |
| **WAT 41** | **East of Howe Road, adjoining the Icknield Way** | | | 13.77 | Agriculture - used as grazing | Residential | More vulnerable | 100% | 0% | 0% | 1% | 3% | 8% | Groundwater levels are estimated to be at least 5m below the ground surface. | **Rejected** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Site is within AONB, with likely impacts on landscape views.<br>• Site is located outside Watlington Built Form.<br>• Site is a considerable distance from Watlington's facilities.<br>• Site abuts a historic pathway, the Icknield Way. |
| **WAT 42** | **West of Howe Road, adjoining the Icknield Way** | | | 34.59 | Agriculture - grazing and woodland | Residential | More vulnerable | 100% | 0% | 0% | 1% | 1% | 4% | Groundwater levels are estimated to be at least 5m below the ground surface. | **Rejected** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Site is within AONB, with likely impacts on landscape views.<br>• Site is located outside Watlington Built Form.<br>• Site is a considerable distance from Watlington's facilities.<br>• Site abuts a historic pathway, the Icknield Way. |
| **WAT 9 (SITE C)** | **Pyrton Lane opposite Icknield** | 255 | 944 | 4.56 | Agriculture - intermittent use | Residential | More vulnerable | 100% | 0% | 0% | 0% | 0% | 0% | Groundwater levels are estimated to be 0.5 - 5m below the ground surface. | **Preferred Site** | • Low risk of fluvial flooding (Flood Zone 1) and surface water flooding. | • Site is currently part of a planning proposal.<br>• Can provide 60 dwellings, 40% of which would be affordable homes. |

# B Map of Proposed and Excluded Sites

# Watlington Neighbourhood Development Plan Sites Assessed within WNDP

This map identifies the 16 sites assessed within the WNDP and this report.
It does not include sites WAT7 and WAT8, which due to their location within Pyrton Parish, could not be allocated within WNDP.

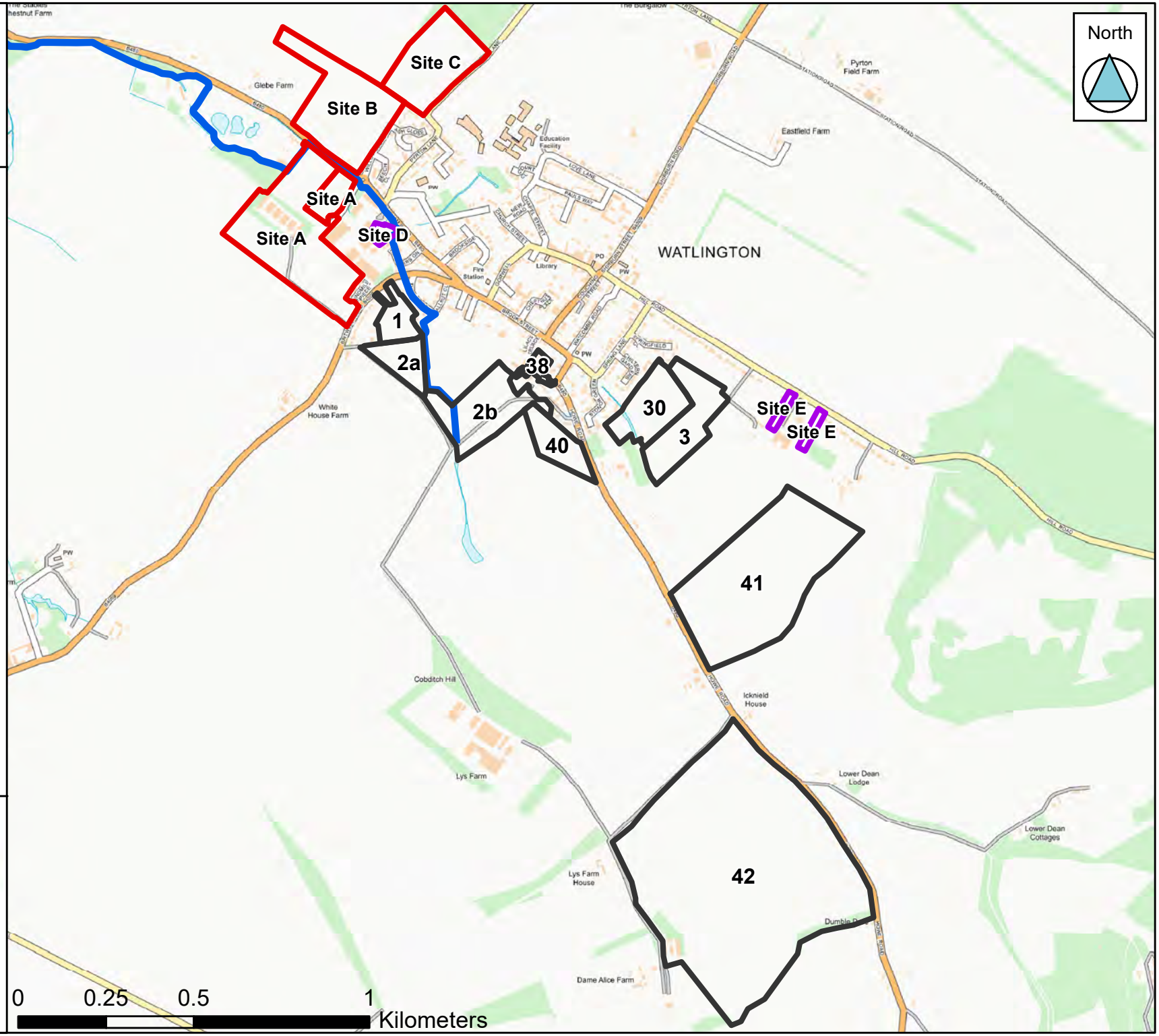
## Legend

- WNDP Preferred Sites
- WNDP Additional Sites
- WNDP Rejected Sites
- Main River



Watlington Neighbourhood Development Plan

JBA consulting



# C Watlington Level 2 Site Summary Sheets

# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

## Table of Contents

# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

| | |
|---|---|
| **Site reference** | WAT 11 / 12 (SITE A) |
| **Site name** | Land South of Cuxham Road, Watlington |

<table>
<tr><td rowspan="5">Site details</td><td>OS Grid reference</td><td>SU 68107 94633</td></tr>
<tr><td>Area</td><td>8.64 Ha</td></tr>
<tr><td>Current land use</td><td>Agricultural land - occasional pasture/grazing</td></tr>
<tr><td>Proposed site use</td><td>Residential development</td></tr>
<tr><td>Flood risk vulnerability</td><td>More vulnerable</td></tr>
<tr><td rowspan="5">Sources of flood risk</td><td>Existing watercourses</td><td>The main river Chalgrove Brook flows as an open channel along the northern boundary of the site. An unnamed drainage ditch, classified as an ordinary watercourse, borders the west of the site, and forms a confluence with the Chalgrove Brook.</td></tr>
<tr><td>Flood history</td><td>The site is not identified as having been affected by fluvial flooding within the Environment Agency Historic Flood Map. There are no recorded flood incidents within the site boundary itself, several flood incidents have occurred on Cuxham Road. Flooding was reported at the junction between Cuxham Road and Pyrton Lane in 2001 and the junction of Cuxham Road and Hurdlers Green between August 2004 and July 2006.<br>In addition, The Goggs, located 170m east of the site experienced groundwater flooding during 2002 and February 2014.</td></tr>
<tr><td rowspan="2">Fluvial</td><td>
<table>
<tr><th colspan="4">Proportion of site at risk in Flood Zones</th></tr>
<tr><th>FZ3b</th><th>FZ3a</th><th>FZ2</th><th>FZ1</th></tr>
<tr><td>6%</td><td>7%</td><td>2%</td><td>79%</td></tr>
</table>
</td></tr>
<tr><td>Available modelled data:<br>An Environment Agency model of the Chalgrove Brook at Watlington (2014) provides modelled fluvial flood risk data for the site.<br><br>Flood characteristics: The northern portion of the site is at risk of flooding from the Chalgrove Brook during the 1 in 100-year (1% AEP) and 1 in 1,000-year (0.1% AEP) flood events.</td></tr>
<tr><td rowspan="2">Surface Water</td><td>
<table>
<tr><th colspan="2">Proportion of site at risk (RoFSW)</th></tr>
<tr><th>30-year</th><th>100-year</th><th>1,000-year</th></tr>
<tr><td>0%</td><td>1%</td><td>26%</td></tr>
</table>
</td></tr>
<tr><td>Description of surface water flow paths: Surface water flood risk to the site is confined to the floodplain of the Chalgrove Brook, in the north of the site, and is predicted to affect the north of the site during the 1 in 100-year (1% AEP) and 1 in 1,000-year (0.1% AEP) rainfall events.</td></tr>
<tr><td>Groundwater</td><td>Groundwater Flood Risk Map class (depth of groundwater below ground surface)</td></tr>
</table>

# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

| | |
|---|---|
| **Site reference** | WAT 11 / 12 (SITE A) |
| **Site name** | Land South of Cuxham Road, Watlington |

| | | | | |
|---|---|---|---|---|
| | | The JBA Groundwater map estimates groundwater levels on the site to be between 0.5 and 5m below the ground surface. | | |
| | **Reservoir** | The site is not at risk from reservoir flooding. | | |
| | **Canal** | There are no canals within 100m of the site. | | |
| **Flood risk management infrastructure** | **Defences** | **Defence Type** | **Standard of Protection** | **Condition** |
| | | The site does not receive protection from flood defences. | | |
| | **Residual risk** | **Culvert / structure blockage?** | There are no culverts within the site boundary. However, sections of the Chalgrove Brook are culverted upstream of the site, beneath Brook Street, Britwell Road and Cuxham Road | |
| | | **Impounded water body failure?** | The site is not at risk of inundation in the event of reservoir failure. | |
| | | **Defence breach / overtopping?** | **Breach Zone** | |
| | | | The site is not at risk from breach of defences. | |
| **Emergency planning** | **Flood warning** | The site does not lie in an Environment Agency flood warning area. Environment Agency flood warnings are now issued to individuals by phone, email or text message via the Flood Information Service. | | |
| | **Access and egress** | Access to and egress from the site is possible to the south east of the site, onto the southbound B4009 Britwell Road. The Cuxham Road and the northern section of Britwell Road are susceptible to fluvial and surface water flooding, particularly where the roads border or cross the Chalgrove Brook. The proposed realignment of the B4009 may also allow safe access to the west, onto Cuxham Road. | | |
| **Climate Change** | **Climate change allowances for '2080s'** | **River Basin District** | **Central** | **Higher Central** / **Upper End** |
| | | Thames | 25% | 35% / 70% |
| | **Implications for the site** | The upper end climate change allowance of 70%, is likely to increase the extent of the 1 in 100-year flood event to equal the current Flood Zone 2 extent. | | |

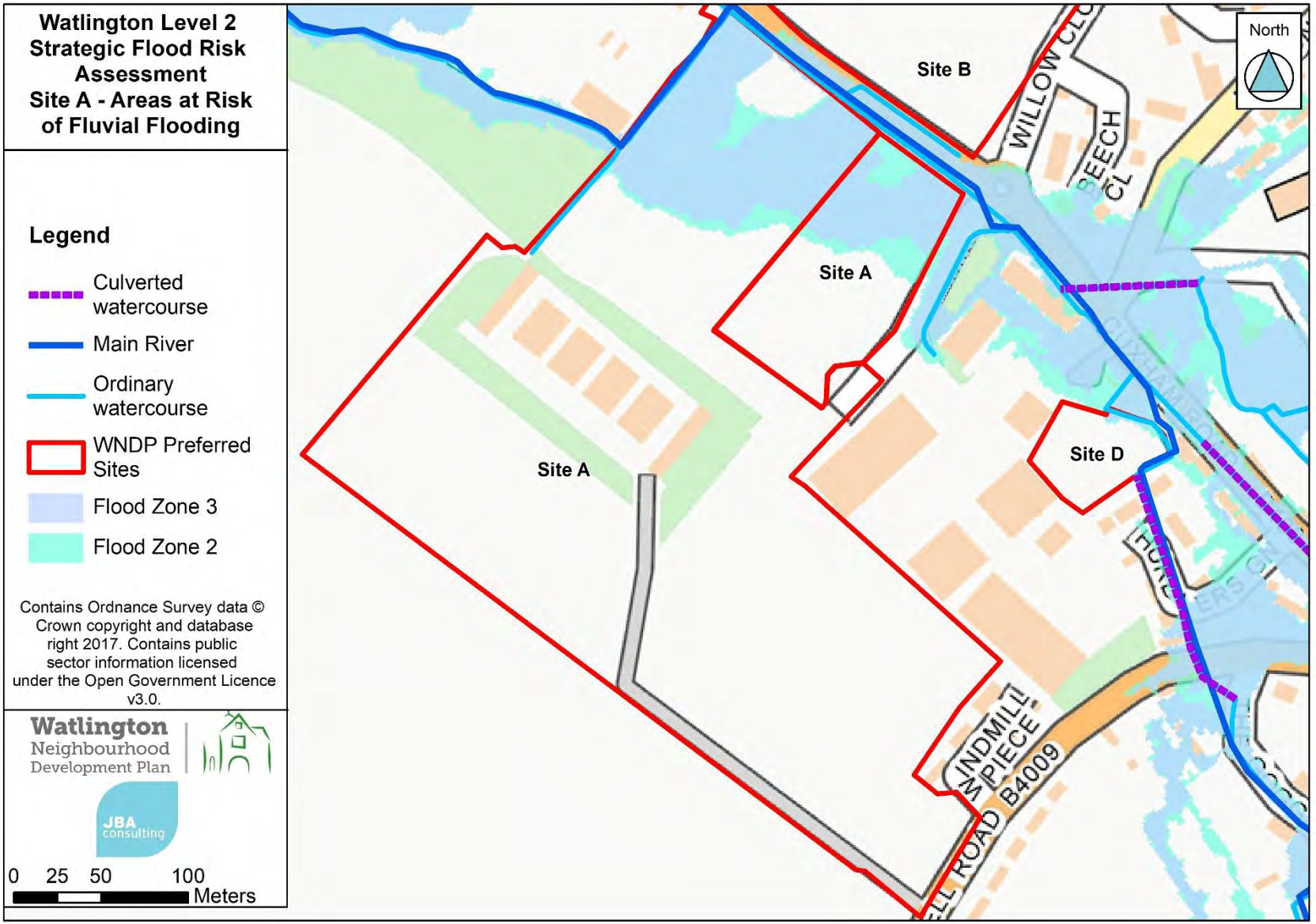
# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

| | |
|---|---|
| **Site reference** | WAT 11 / 12 (SITE A) |
| **Site name** | Land South of Cuxham Road, Watlington |

| | | |
|---|---|---|
| **Drainage control and impact mitigation** | **Bedrock Geology** | Desktop assessment indicates that the site is underlain by West Melbury Marl chalk. |
| | **Superficial Geology** | The north of the site is overlain by alluvium, a mixture of clay, silt, sand and gravel. In the south, subaerial slope deposits of a similar composition overlie the bedrock geology. |
| | **Soils** | The site contains loamy, freely draining soils, which allow rainfall to drain through the soil layers. The soils are slightly acidic, but base-rich. |
| | **Sustainable Drainage Systems (SuDS)** | • Due to the chalk geology, there is considerable potential for use of infiltration SuDS techniques, subject to favourable infiltration testing results. Groundwater monitoring may also be required to assess infiltration suitability.<br>• There are good opportunities for above ground SuDS, with neighbouring watercourses providing discharge locations for surface water from the site.<br>• Proposed drainage features in the north of the site should be designed to be resilient to fluvial flooding.<br>• Conveyance features should be designed above ground and following natural surface water flow paths where possible.<br>• Opportunities should be taken to deliver SuDS with multiple benefits, such biodiversity and recreation, which meet the sustainability policies of the WNDP.<br>• Further information on SuDS is available in the CIRIA SuDS Manual (2015) and on the Oxfordshire County Council website. |
| | **Groundwater SPZ** | The south eastern corner of the site is located within Groundwater Source Protection Zone 3, the contributing catchment. |
| | **Historic Landfill Site** | No part of the site is designated by the Environment Agency as an historic landfill site. |
| | **Opportunities for flood risk betterment** | Opportunities to provide flood storage for the Chalgrove Brook in the north of the site. Attenuating flood waters on the site could lessen the flooding impacts on the downstream properties in west Watlington, Cuxham and Chalgrove.<br><br>Opportunity to implement exemplar SuDS design following OCC guidance on runoff rates and volumes, contributing to the reduction of flood peaks downstream. |
| **Recommenda-tions** | **Recommendations for development of the site** | |
| | 1. The site layout should be planned sequentially, avoiding development within Flood Zone 2 and Flood Zone 3.<br>2. SuDS used for the storage of surface water should be located outside Flood Zone 3, to prevent a loss in floodplain storage and minimise the risk of fluvial flooding to the structures.<br>3. Infiltration testing, and where necessary groundwater monitoring, are recommended before the use of infiltration drainage systems on the site, such as soakaways. | |

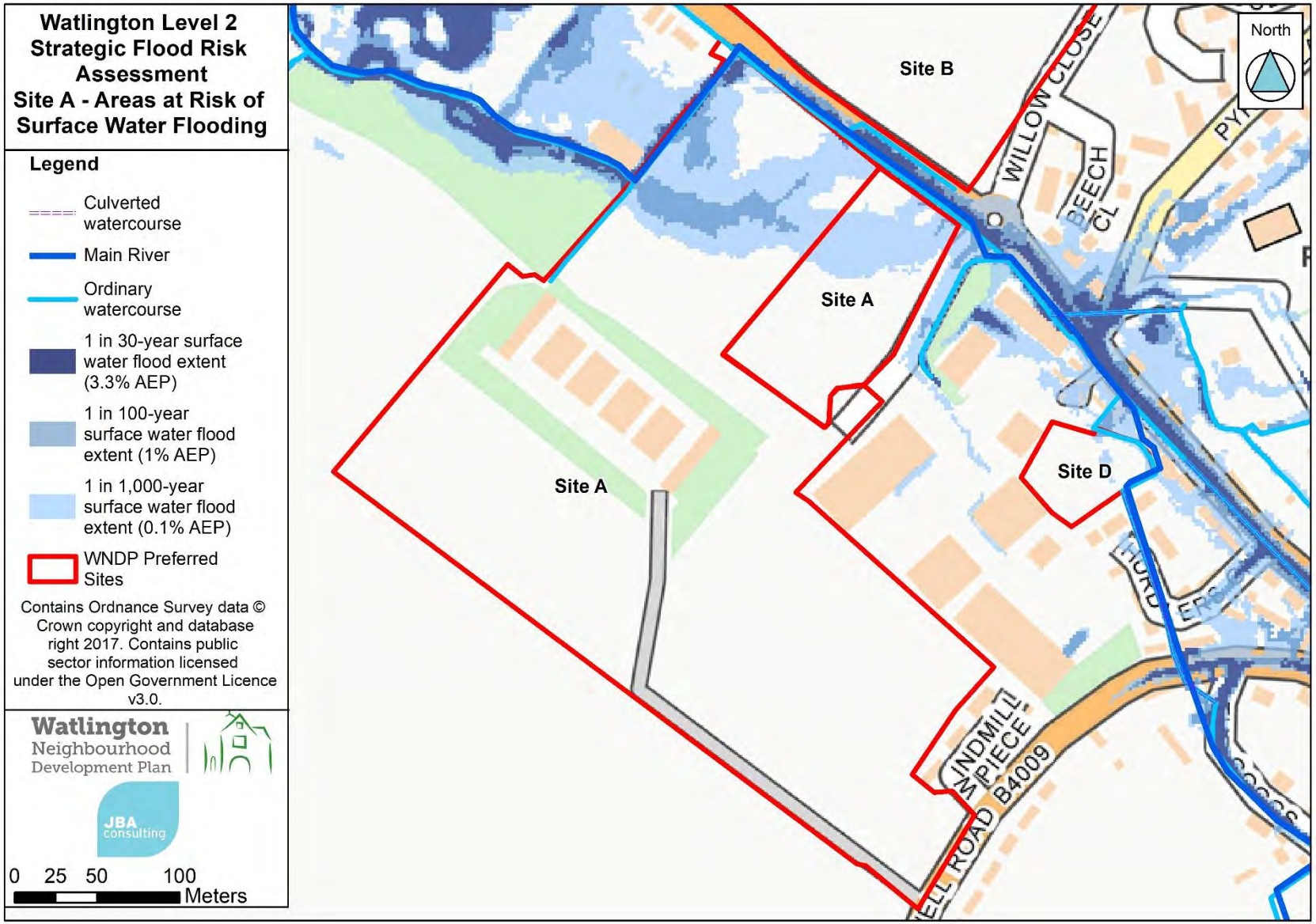
# Watlington Neighbourhood Development Plan

## Level 2 SFRA Detailed Site Summary



# Watlington Neighbourhood Development Plan

## Level 2 SFRA Detailed Site Summary



# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

| | |
|---|---|
| **Site code** | WAT 34 (SITE D) |
| **Site name** | Bucklands Paddock |

<table>
<tr><td rowspan="5">Site details</td><td>OS Grid reference</td><td>SU 68364 94604</td></tr>
<tr><td>Area</td><td>0.31 Ha</td></tr>
<tr><td>Current land use</td><td>Unused grass and scrub area</td></tr>
<tr><td>Proposed site use</td><td>Residential – park homes</td></tr>
<tr><td>Flood risk vulnerability</td><td>Highly vulnerable</td></tr>
<tr><td rowspan="6">Sources of flood risk</td><td>Existing watercourses</td><td>The main river Chalgrove Brook borders the east and north of the site, before continuing northwestwards along Cuxham Road.</td></tr>
<tr><td>Flood history</td><td>The site is not identified as having been affected by fluvial flooding within the Environment Agency Historic Flood Map. However, incidents of flooding have been reported close to the site, at the junction between Cuxham Road and Pyrton Lane in 2001 and the junction of Cuxham Road and Hurdlers Green between August 2004 and July 2006. Brook Road and The Goggs to the south of the site also experienced severe flooding caused by groundwater emergence during the floods of Winter 2014.</td></tr>
<tr><td rowspan="3">Fluvial</td><td>Proportion of site at risk in Flood Zones
<table>
<tr><th>FZ3b</th><th>FZ3a</th><th>FZ2</th><th>FZ1</th></tr>
<tr><td>2%</td><td>1%</td><td>3%</td><td>94%</td></tr>
</table></td></tr>
<tr><td>Available modelled data: An Environment Agency model of the Chalgrove Brook at Watlington (2014) provides modelled fluvial flood risk data for the site.<br>Flood characteristics: A small area of the northeast of the site is at risk of flooding during the 1 in 100-year (1% AEP) and 1 in 1,000-year (0.1% AEP) fluvial flood event.</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">Surface Water</td><td>Proportion of site at risk (RoFSW)
<table>
<tr><th>30-year</th><th>100-year</th><th>1,000-year</th></tr>
<tr><td>0%</td><td>1%</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Description of surface water flow paths: Surface water flood risk is concentrated along the northeast boundary of the site, following the route of the Chalrgove Brook, during the 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) rainfall events. During the 1 in 1,000-year (0.1% AEP) rainfall event, an area of surface water ponding is predicted at the centre of the site, downstream of the outlet to the culverted Chalgrove Brook.</td></tr>
<tr><td rowspan="2">Groundwater</td><td>Groundwater Flood Risk Map class (depth of groundwater below ground surface)</td></tr>
<tr><td>The JBA Groundwater map estimates groundwater levels on the site to be between 0.5 and 5m below the ground surface.</td></tr>
</table>

# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

| | |
|---|---|
| **Site code** | WAT 34 (SITE D) |
| **Site name** | Bucklands Paddock |

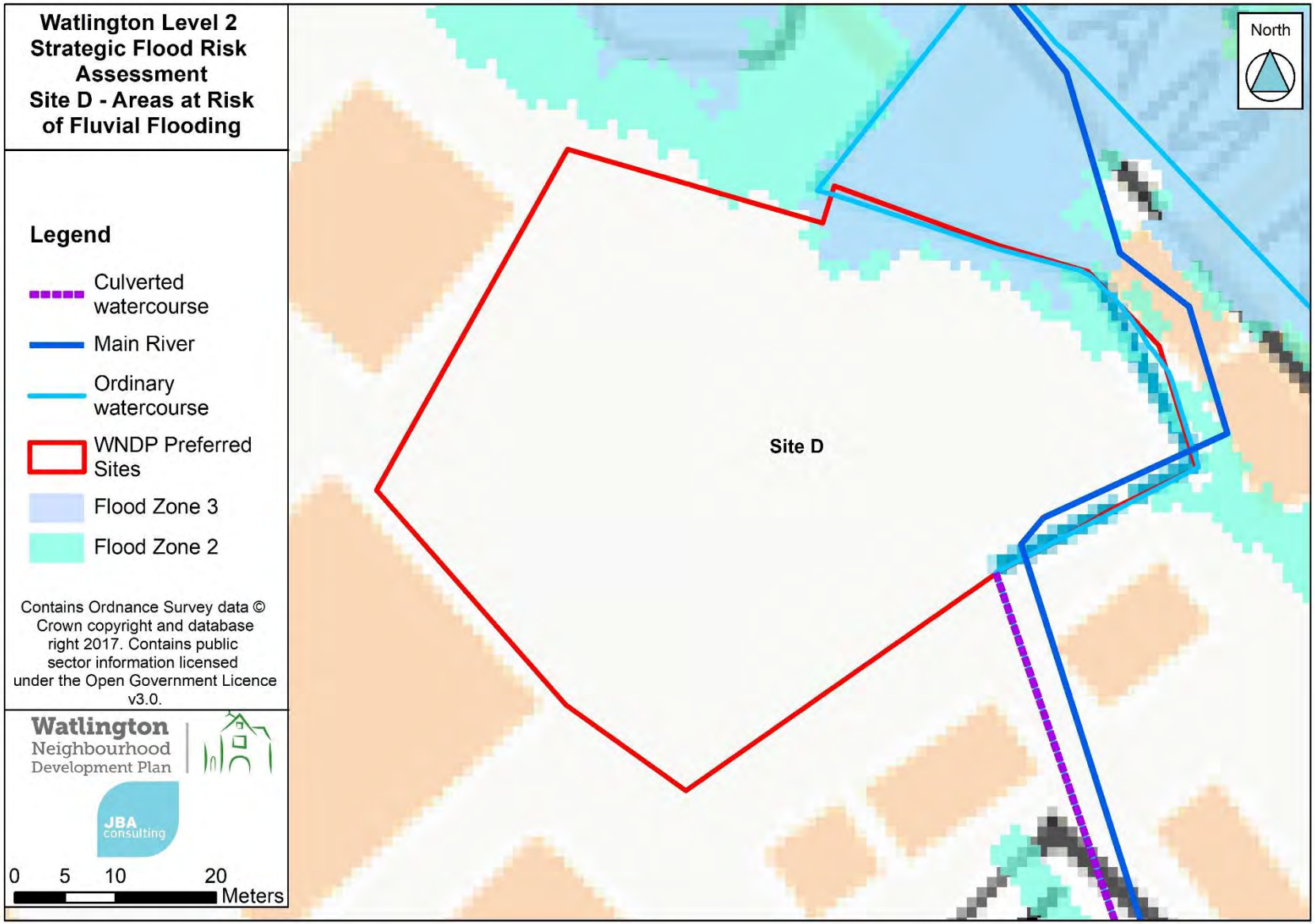
<table>
<tr><td rowspan="2"></td><td>Reservoir</td><td colspan="3">The site is not at risk from reservoir flooding.</td></tr>
<tr><td>Canal</td><td colspan="3">There are no canals within 100m of the site.</td></tr>
<tr><td rowspan="5">Flood risk management infrastructure</td><td rowspan="2">Defences</td><td>Defence Type</td><td>Standard of Protection</td><td>Condition</td></tr>
<tr><td colspan="3">The site does not receive protection from flood defences.</td></tr>
<tr><td rowspan="3">Residual risk</td><td>Culvert / structure blockage?</td><td colspan="2">The site lies downstream of a culvert outlet, however any blockage to this structure would be likely to cause flooding upstream, rather than to the site itself.</td></tr>
<tr><td>Impounded water body failure?</td><td colspan="2">The site is not at risk of inundation in the event of reservoir failure.</td></tr>
<tr><td rowspan="2">Defence breach / overtopping?</td><td colspan="2">Breach Zone</td></tr>
<tr><td colspan="2">The site is not at risk from breach of defences.</td></tr>
<tr><td rowspan="2">Emergency planning</td><td>Flood warning</td><td colspan="3">The site does not lie in an Environment Agency flood warning area. Environment Agency flood warnings are now issued to individuals by phone, email or text message via the Flood Information Service.</td></tr>
<tr><td>Access and egress</td><td colspan="3">Access to and egress from the site are on Cuxham Road to the north and Hurdlers Green to the east. Both roads are at risk of fluvial flooding during a 1 in 100-year flood event, and at risk of surface water flooding during rainfall events of a 1 in 30-year return period and above. Emergency planning arrangements should be specified within a site-specific flood risk assessment.</td></tr>
</table>

# Watlington Neighbourhood Development Plan
# Level 2 SFRA Detailed Site Summary

<table>
<tr><td rowspan="3">Climate Change</td><td rowspan="2">Climate change allowances for ‘2080s’</td><td>River Basin District</td><td>Central</td><td>Higher Central</td><td>Upper End</td></tr>
<tr><td>Thames</td><td>25%</td><td>35%</td><td>70%</td></tr>
<tr><td>Implications for the site</td><td colspan="4">Climate change is likely to change the Flood Zone classification of this site.</td></tr>
<tr><td rowspan="8">Drainage control and impact mitigation</td><td>Bedrock Geology</td><td colspan="4">The site is underlain by West Melbury Marl chalk.</td></tr>
<tr><td>Superficial Geology</td><td colspan="4">The majority of the site is overlain by alluvium, a mixture of clay, silt, sand and gravel, with the south of the site covered by subaerial slope deposits of a similar composition.</td></tr>
<tr><td>Soils</td><td colspan="4">The site contains loamy, freely draining soils, which allow rainfall to drain through the soil layers. The soils are slightly acidic, but base-rich.</td></tr>
<tr><td>SuDS</td><td colspan="4">• Due to the proximity of the site to an existing park home development, post-development runoff rates should be tighty controlled. Source control SuDS, such as swales, permeable paving and green roofs could be implemented to achieve this.<br>• The underlying chalk geology provides considerable potential for use of infiltration SuDS techniques, subject to favourable infiltration testing results. Groundwater monitoring may also be required to assess infiltration suitability.<br>• Opportunities should be taken to deliver SuDS with multiple benefits, such biodiversity and recreation, which meet the sustainability policies of the WNDP.<br>• Further information on SuDS is available in the CIRIA SuDS Manual (2015) and on the Oxfordshire County Council website.</td></tr>
<tr><td>Groundwater SPZ</td><td colspan="4">The site is not located within a Groundwater Source Protection Zone.</td></tr>
<tr><td>Historic Landfill Site</td><td colspan="4">No part of the site is designated by the Environment Agency as an historic landfill site.</td></tr>
<tr><td>Opportunities for flood risk betterment</td><td colspan="4">Opportunity to implement exemplar SuDS design, following OCC guidance on runoff rates and volumes, to contribute to the reduction of flood peaks downstream.</td></tr>
<tr><td rowspan="2">Recommend-ations</td><td colspan="5">Recommendations for development of the site</td></tr>
<tr><td colspan="5">1. The site layout should be planned sequentially, avoiding development within Flood Zone 2 and Flood Zone 3.<br>2. Infiltration testing, and where necessary groundwater monitoring, are recommended before the use of infiltration drainage systems on the site, such as soakaways.<br>3. Due the higher vulnerability of the proposed development, safe access and egress arrangements for the site in the event of a flood should be specified within the site-specific flood risk assessment, and a Flood Evacuation Plan may be required.</td></tr>
</table>

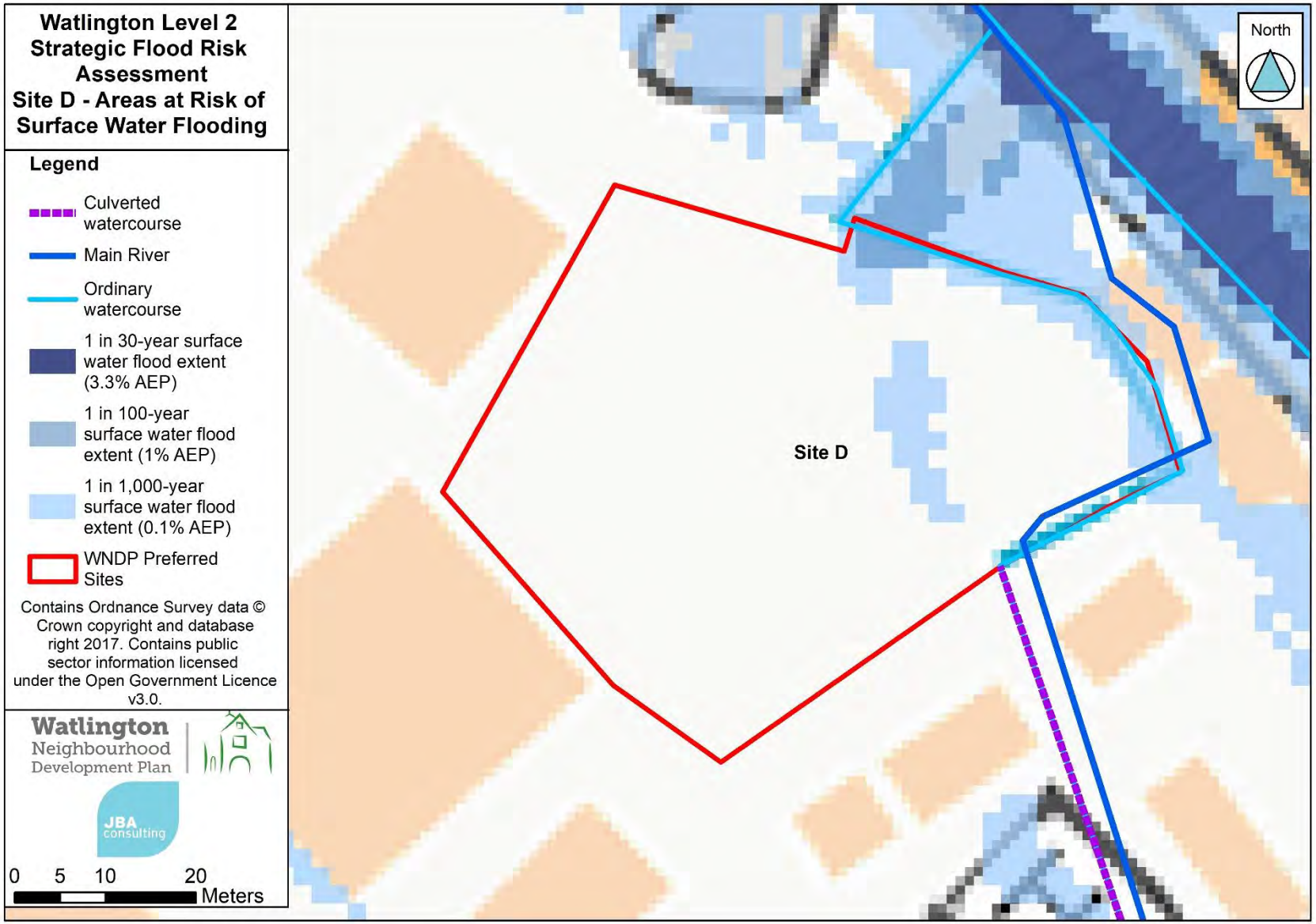
# Watlington Neighbourhood Development Plan

## Level 2 SFRA Detailed Site Summary



# Watlington Neighbourhood Development Plan

## Level 2 SFRA Detailed Site Summary



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